The Design of Everyday Things — Don Norman

Research Notes

Purpose: *To extract and organize insights relevant to my research question:*
How could this help me automatically predict what actions are possible with a 3D object?

Core Ideas

Discoverability and Understanding (pg. 19–21)

Two key characteristics of good design:

1. ***Discoverability:*** *Can users figure out what actions are possible, where, and how to perform them?*
2. ***Understanding:*** *Do users comprehend what those actions mean and how to use the product correctly?*

- *Relevant components must be visible and communicate the correct message*
- *"Design is concerned with how things work, how they are controlled, and the nature of the interaction between people and technology"*
- *Often, designs are made by engineers with limited understanding of people*

Human-Centered Design (pg. 23)

- *A process ensuring designs match the needs and capabilities of the people who use them*
- *Balances functionality, usability, and emotional experience*

Discoverability: Five Foundational Concepts

1. Affordances (pg. 26–28)

Definition:
"An affordance is the relationship between the properties of an object and the capabilities of the agent that determine how the object could possibly be used."

Key Points:

- *Affordance is a* ***relationship****, not an intrinsic property*
- *Exists between object qualities and agent abilities*
- ***Anti-affordance:*** *Prevents interaction (e.g., glass blocks passage)*
- *If an affordance or anti-affordance is not perceivable, a signifier is required*
- *Affordances may exist even if invisible — but for designers, visibility is critical because it communicates possible*

actions
- *"Visible affordances provide strong clues to operation"*

2. Signifiers (pg. 28–31)

People need clues about what something is for, what is happening, and what actions are possible.

- *Signifiers communicate appropriate behavior — visual, auditory, or tactile indicators*
- ***Deliberate:** Signs like "PUSH" or "EXIT"*
- ***Accidental:** Footpaths through grass, or people waiting at a station signaling the train hasn't arrived*
- *Signifiers are signals, not actions*
- ***Misleading signifiers:** Something appears to be usable (a false door or button) but isn't*

Key Distinction:

- ***Affordances** represent what actions are possible*
- ***Signifiers** communicate where and how to act*

3. Mapping (pg. 33)

The relationship between controls and their results.

Good mapping simplifies understanding:

- *Example: Turning a steering wheel right moves the car's front right*
- *Example: Light switches arranged in the same layout as lights*

Natural mappings create intuitive use and reduce memory effort.

4. Feedback (pg. 35)

Feedback communicates the result of an action.

- *Missing feedback creates user anxiety and repeated attempts (like pressing an elevator button multiple times)*

Feedback should be:

- *Immediate*
- *Informative*
- *Non-distracting*

Too much feedback can be overwhelming — e.g., machines giving constant updates.

5. Constraints

Limit possible actions to prevent errors or guide correct behavior.

Can be:

- ***Physical:** Plug only fits one way*
- ***Cultural:** Red = stop, green = go*
- ***Logical/Semantic:** Shape or position implies function*

2 *Chapter 3 — Knowledge in the Head vs Knowledge in the World*

Conceptual and Mental Models (pg. 38)

- ***Conceptual model:*** *Simplified explanation of how something works (e.g., files and folders on a computer)*
- ***Mental model:*** *A user's internal understanding of how something works, shaped by experience and signifiers*
- *Mental models influence perceived affordances and expected feedback*

Chapter 2 — The Gulfs of Execution and Evaluation

- ***Gulf of Execution:*** *Difficulty in figuring out how to operate a system*
- ***Gulf of Evaluation:*** *Difficulty in understanding what happened after acting*

Designers must bridge both gulfs by making options and results visible and meaningful.

Seven Stages of Action:

1. *What do I want to accomplish?*
2. *What are the alternative actions?*
3. *What actions can I do now?*
4. *How do I do it?*
5. *What happened?*
6. *What does it mean?*
7. *Have I accomplished my goal?*

Opportunistic actions:
Spontaneous, context-based behaviors that require less effort and emerge naturally from the environment (relevant to emergent gameplay).

Three Levels of Processing

- ***Visceral:*** *Fast, subconscious, aesthetic*
- ***Behavioral:*** *Routine, learned physical skills*
- ***Reflective:*** *Conscious reasoning, self-critique, planning*

Good design engages all three levels for both cognitive and emotional connection.

Human Error (pg. 71)

- *Human error often results from poor design, not user failure*
- *"Machines are not people"*
- *Designers must ensure machine behavior is understandable and forgiving*
- *Use affordances, signifiers, mapping, and constraints to guide correct actions*

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3 *Chapter 3 — Knowledge in the Head vs Knowledge in the World*

Good design reduces memory load by externalizing cues and structure.

Knowledge in the Head:

- *Memory, experience, learned skills (e.g., typing from memory)*

Knowledge in the World:

- *Cues, signifiers, constraints present in the environment (e.g., labels, symbols)*

Types of Knowledge:

- ***Declarative Knowledge:*** *Facts we can state*
- ***Procedural Knowledge:*** *Skills we can perform subconsciously*

Tradeoff:

- *In-head knowledge = efficient once learned, but forgettable*
- *In-world knowledge = more accessible, but can clutter the environment*
- ***The best design balances both***

Natural Mappings & Memory Aids

- *Natural mappings reduce memory load (e.g., stove knobs arranged to match burners)*
- *Constraints and signifiers guide behavior without requiring recall*
- ***Memory aids:*** *Checklists, icons, reminders — external supports that align with human limitations*

Chapter 4 — Sound and Perception

Sound conveys crucial feedback beyond vision.

Natural sounds indicate:

- *Material (metal, wood, soft, hard)*
- *Type of interaction (hit, slide, tear, crumble)*

Essential for multisensory feedback — important for game design realism.

Real finding: *Pedestrians are more likely to be hit by silent hybrid/electric cars — sound cues are safety affordances.*

Chapter 5 — Designing for Error

Human error is inevitable; design must anticipate and minimize it.

Systems should:

- *Prevent errors with constraints*

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- *Make actions reversible (e.g., undo commands)*
- *Make acted-upon items prominent*
- *Support easy recovery from mistakes*

Key Insight:
The problem isn't user failure — it's when design requires machine-level precision from humans.

- *Put knowledge in the world so users don't need perfect recall*
- *Bridge the gulfs with **feedforward** (visibility before action) and **feedback** (visibility after action)*

Chapter 6 — Design Thinking & Human-Centered Design

HCD Definition: *Ensures the product is understandable, usable, effective, and enjoyable.*

Effective design satisfies:

- *Form and shape*
- *Cost and reliability*
- *Usability and joy*

Double Diamond Model:

Discover → Define → Develop → Deliver

Includes cycles of prototyping and testing.

Prototyping Example: *Wizard of Oz method (simulate systems to study behavior before full build).*

Testing: *Small iterative groups (e.g., 5 users per round).*

Failures = learning experiences.

Chapter 7 — People, Technology, and the Future

As technology evolves, humans and machines will increasingly merge:

- *People may become partly artificial (cyborgs)*
- *Machines will develop neural-like reasoning*
- *Raises ethical questions about identity, intelligence, and dependence*

Technology and Memory

Debate: *Does tech make us smarter or dependent?*

- *Tech externalizes memory, freeing the brain for creativity*

 ## *Chapter 3 — Knowledge in the Head vs Knowledge in the World*

- *Overdependence risks loss of basic skills*

Key Idea: *Humans + Machines are more powerful together.*

The strongest systems combine human creativity with machine precision — a metaphor for AI-driven design and affordance reasoning.

Relevance to My Research

- ***Affordances and signifiers*** *are the core bridge between object geometry and human action recognition*
- ***Mapping, feedback, and constraints*** *inform how an AI system could predict usable affordances from form and context*
- ***Human-centered design principles*** *align directly with making AI-driven affordance tools intuitive, ethical, and assistive*

Quote to Remember:

> *"Affordances exist even if they are not visible. For designers, their visibility is critical." – Don Norman*

(This directly parallels the challenge of making hidden 3D affordances machine-detectable for games.)

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